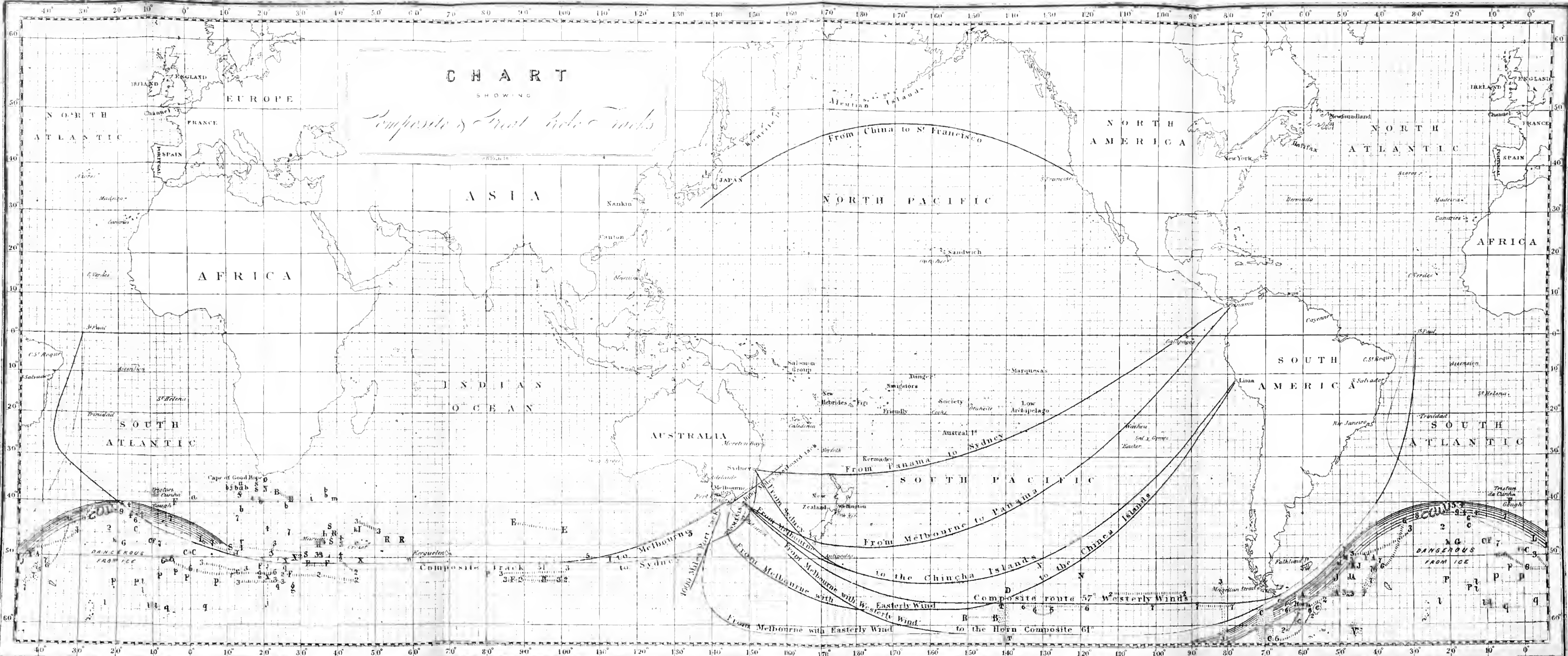


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M. RAMSAY



CHART

SHOWING

Composite & Great Circle routes

ICEBERGS
IN THE
SOUTHERN OCEAN;

A PAPER

READ BEFORE THE HISTORIC SOCIETY OF LANCASHIRE AND CHESHIRE,
ON THE 19TH OF NOVEMBER, 1857,

AND

CORRECTED FROM REPORTS OF MORE RECENT DATES.

BY

JOHN THOMAS TOWSON, F.R.G.S.

PRINTED FOR PRIVATE CIRCULATION.

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1859.

MUSEUM OF VICTORIA



15059

TO THE
SHIPOWNERS AND MERCHANTS
OF THE
PORT OF LIVERPOOL.

GENTLEMEN,

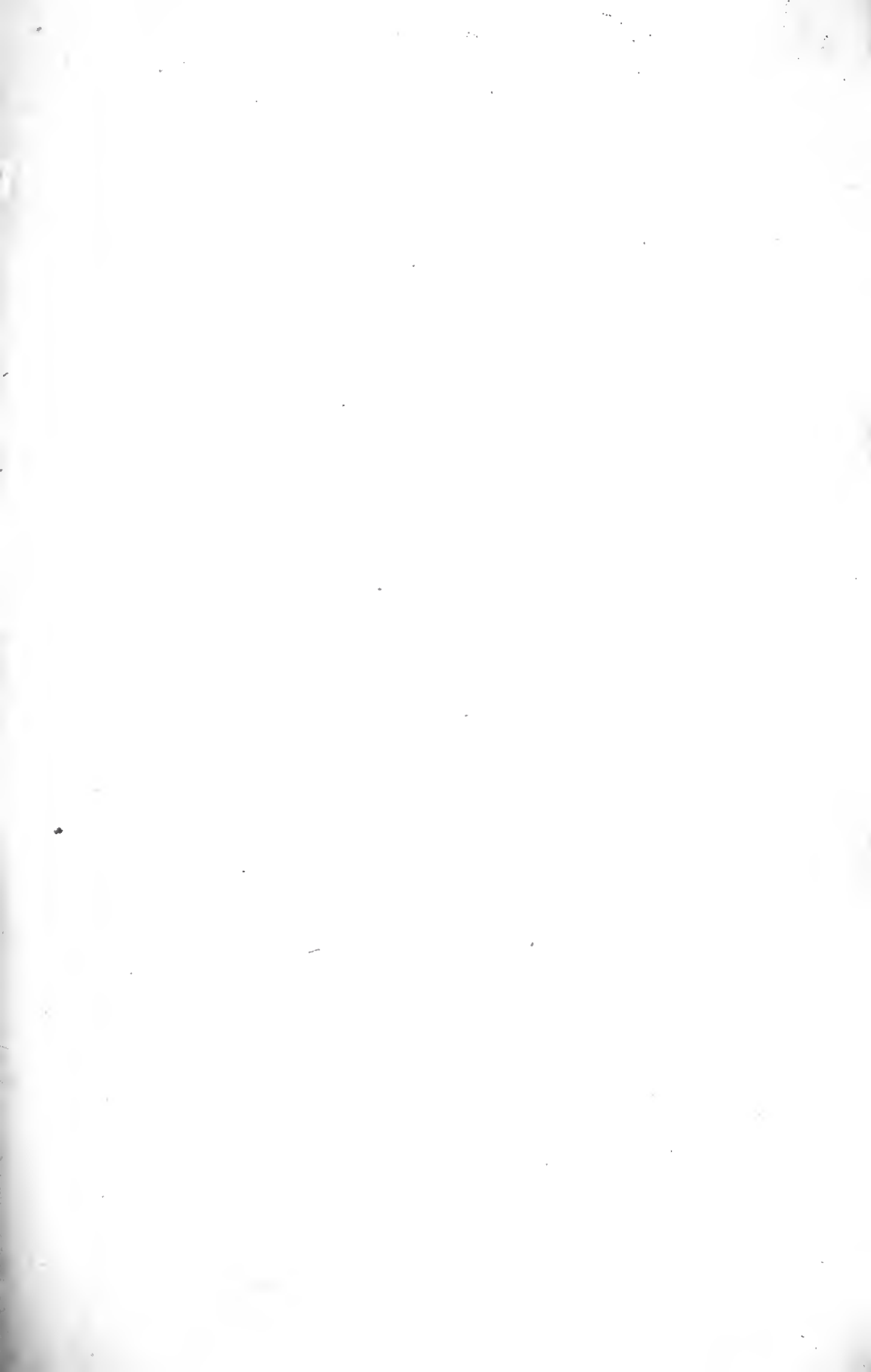
In again printing and offering for your use a Paper in connection with Navigation, permit me to express how highly I appreciate your kindness, in so liberally recognizing my humble endeavours to aid the exertions of your zealous Captains; and, also, again to assure you of my determination to devote my future exertions, to aid the advancement of the science of Navigation in which you, Gentlemen, are so deeply interested.

In compiling the present paper, little amount of scientific skill is displayed. It consists in reducing to system the reports of your Captains and others. But if this should be the means, in the hands of the Mariner, of reducing the risk of loss of life and property, or of removing any unnecessary alarm, I believe you will consider that my labors have not been in vain.

I am, GENTLEMEN,

Your obliged and humble Servant,

JOHN THOMAS TOWSON.



ICEBERGS IN THE SOUTHERN OCEAN.

Having during the last ten years directed a very considerable amount of attention to the subject of shortening the time occupied in voyages to and from Australia, I have taken a very great interest in every matter calculated to affect the risk attendant on these voyages. It was well-known that the Southern ocean was sometimes visited by icebergs, but this fact was not regarded as considerably increasing the danger of navigating these seas. Nor did I meet with any complaint that the new route I had aided in tracing out was more encumbered with icebergs than the old track, until the latter months of 1854, six years after the new route was adopted. During the months of November and December, 1854, and the first four months of 1855, very alarming accounts were forwarded to me of ice impediments, both on the outward and homeward passage. Naturally I felt especially called on to obtain all the information in my power, and to place it before the practical mariner in the form best suited to aid him in providing for the safety of his ship. Since this matter was one that would admit of no unnecessary delay, as early as May, 1855, I read, before the Liverpool Literary and Philosophical Society, the results of my investigation, and printed and circulated them widely amongst the masters commanding ships bound for Australia. On that occasion I not only pointed out the region especially dangerous from ice, but I requested of ship-masters the favour of returning to me accounts of all the ice they met with in the Austral seas. This request has been responded to in a spirit as creditable to the ship-masters of Liverpool as it has been flattering to myself. It is rather surprising that, after three years' investigation, I have so little, calculated to be of practical value, to add to the remarks previously published, although the data have been exceedingly extended. I have to acknowledge the aid afforded me by the records of several American gentlemen connected with the Seal trade of New South Shetland; of Luit. J. Van Gogh, Director of the Marine Department of the Royal Netherland Meteor-

logical Institute; and of officials of our own Government, as well as those of the captains of Australian vessels to whom my appeal was addressed. Further, I have to acknowledge the services of several passengers, who have furnished me with sketches of icebergs, and the kindness of a lady-passenger on a homeward voyage of the "Lightning," in drawing for me a beautiful sketch of an extraordinary iceberg, 420 feet high; this is also admirable as a work of art. I have also availed myself of information afforded in the published journals of Captains Cook and Furneaux, and other officers engaged in voyages of discovery, by which means I have been enabled to carry back my investigation to 1772.

Ice of the Polar Seas may be divided into two classes—sheet ice and icebergs. These are quite distinct in their origin. Sheet ice is met with in different forms, which, however, are but various conditions of ice arising from a common origin,—in fact, the same ice is found at different times, under all the varied forms of ice-fields, ice-floes, pack, stream, drift and brash ice. All these are the result of one year's frost, and the extent and depth of sheet ice depend generally on the intensity of the previous winter's cold, and the circumstances connected with the succeeding season, which regulate the breaking up of the frozen surface. The return of the milder season gradually separates the ice into enormous fields, which are cast adrift on the ocean. Some of these in the Arctic region have been known to have an area of more than one hundred square miles. They vary from three to thirty feet in thickness. When broken into smaller sheets they are termed floes. When reduced to fragments crowded together they form what is termed pack ice; this, when elongated, is called a stream; and when further separated, it is known by the names of drift and brash ice,—the latter term being applied when the pieces have been ground down by abrasion, or have lost all the characteristics of their original condition by the thawing action of a milder climate. Icebergs, however, differ altogether both in appearance and origin from the kinds of ice already described. Towering like precipices and pinnacles, varying from one hundred to a thousand feet above the surface of the sea, in some directions they assume the appearance of chalk cliffs, but near the edges of a fracture they exhibit in the sun a translucent appearance of emerald green. Between the spires and ridges at their summits are pools, and in some cases we may term them lakes, of azure blue. Icebergs are not the produce of one season; on the contrary, there is reason to believe that these masses commenced their

formation at a period equally remote with that of the origin of some of our tertiary rocks.* They are of the same nature as the glaciers of the warmer regions of the earth; but instead of being melted in the valleys, they are pressed forward into the ocean till at length the water is sufficient to float them, and immense blocks are broken off. This process has been termed by the Greenland whale fishermen, the "calving" of an iceberg.

Drift ice, and all the other varieties of field ice, not only have a more recent origin, but they are of a less enduring character when drifted into the warmer climates. When carefully examined they are found to consist of crystals of ice and crystals of marine salts, aggregated together, the salt being separated from the water by the process of freezing. It is a well-known fact, that when small particles of ice and salt are mingled together, they will dissolve at a much lower temperature than that at which ice will dissolve; consequently icebergs are found at a much lower latitude than drift ice. Generally drift ice is not to be met with in the southern oceans at a lower latitude than 58° , and, in that region, only in the Austral winter months from April to September inclusive. In one region, to which I shall more particularly refer, it has been found as low as 55° , and in some cases brash ice has been reported in lower latitudes. But in these last instances, from the numerous icebergs adjacent, and from the very irregular sizes and forms of the ice, I am inclined to believe that it consisted of the debris of icebergs, and was not brash ice properly so called.†

In the northern hemisphere, icebergs do not appear to attain the dimen-

* In the northern hemisphere they have their principal birthplace on the coast of Spitzbergen and the eastern shores of Greenland. The Altai mountain range gives rise to glaciers similar to those of Switzerland. But the cold of Siberia is not sufficiently intense to allow these glaciers to become icebergs. There they are gradually dissolved by the summer's sun, and feed with their waters the rivers Kutania and Lena. Still, however, immense blocks of ice are brought down from the glaciers to the coast by these rivers; although they cannot be denominated icebergs, they possess a common origin. In 1799 a Tungusian discovered in one of them the body of a Mammoth, an extinct species of mammal, the fossil remains of which are found in the deposits of the Pliocene period of Lyell. Now since it is a law that the progress of glaciers is slow in proportion to the low temperature of the climate, we cannot imagine that icebergs of the south owe their origin to a more recent period than block ice on the Siberian rivers; consequently we may regard them as possessing a preadamite existence.

† The only report of an ice field in the Southern Hemisphere that I have received was that of one that was seen in the month of September, 1854, in lat. 58° S., long. 56° W.

sions of those of the southern regions. Three hundred feet high is the greatest elevation reported in which we can place reliance. In the southern hemisphere icebergs are reported of heights surpassing the limits of credibility. There are others reported by gentlemen on whose observations we can place implicit dependence, of heights far surpassing those of the northern seas.*

The one already alluded to as sighted by the "Lightning" on the 10th of September, 1856, in lat. $55^{\circ} 33'$ S., long. 140° W., was 420 feet high; and one of our most celebrated and talented naval surveyors informed me that he had seen icebergs in southern regions 800 feet high. The "Generaal Baron von Geen," August 6th, 1840, passed an iceberg 1000 feet high. The "Agneta," on the 23rd of March, 1855, passed an iceberg 960 feet high, in lat. $53^{\circ} 14'$ S., long. $14^{\circ} 41'$ E.

In horizontal dimensions, however, the icebergs of the south exceed those of the north to a greater extent than in elevation. It is only in the southern ocean that the existence of icebergs of miles in circumference is recorded. In September, 1840, an iceberg was seen in lat. 41° S., long. 14° E., a mile in circumference. In January, 1858, in lat. $53^{\circ} 30'$ S., long. 51° W., an iceberg three miles long was observed. But these appear insignificant when compared with a body of ice reported to have been passed by twenty-one ships during the five months of December, 1854, and January, February, March and April, 1855, floating from lat. 44° S., long. 28° W., to lat. 40° S., long. 20° W. This mass has received the various denominations of an immense iceberg, an ice-island, "groote ijseland," and a connected mass of icebergs. Its elevation in no case exceeded 300 feet; but its horizontal dimensions were sixty miles by forty. It was of the form of a hook, the longer shank of which was sixty miles, the shorter forty miles, and embayed between these mountains of ice was a space of water forty miles across. The first account of it was received from the "Great Britain," which, in December, 1854, was reported to have steamed fifty miles along the outer side of the longer shank. This longest range of ice then bore N.E. and S.W., the bay before alluded to, being open to the N.E. Whilst in this position it exposed ships to but little danger, since the bay could only be entered on the

* Dr. Darwin in 1796 noticed the extraordinary size of the icebergs of the southern ocean.

opposite course to that of ships on their homeward passage from Australia. But during the next three months it swung round 90° to the left, and drifted E.N.E. about 100 miles, which brought it very near to the route of outward bound ships, with the bay open to their track. We can scarcely imagine any mass of ice in an equally dangerous form, and I regret to add that one emigrant ship, the "Guiding Star," was embayed and lost on it with all hands. The "Cambridge" and "Salem" were also embayed in March and April, 1855, but through the skill of their commanders they were extricated from the most perilous situation in which we can conceive a ship to be placed by ice in any form. In 1856 I had the opportunity of taking the opinion of the late Dr. Scoresby on the nature of this mass, laying before him the numerous reports I had received concerning it. He believed that it consisted of an immense number of icebergs, that had been drawn together, by some of them having grounded in the track of others, and became afterwards united by the frost of successive centuries; till at length, by some convulsion or otherwise, the whole mass was set adrift. Dr. Scoresby was a very high authority on this subject, and I place great confidence in his opinion. Beyond doubt this was an extraordinary phenomenon, there being no record of any other mass of ice bearing even approximate horizontal proportions to those now described.

In tracing this and other remarkable masses of ice, I have been able to determine the direction of their drift, and their rate of progress. With the exception of one locality, the course of an iceberg is E. by N., rate ten miles per diem. The only exception is, after it has passed to the eastward of the Horn, when its course bends to the N.E., veering round to the east as it approaches the lat. of 40° S., on which parallel from the meridian of 25° W. to 15° W. its progress is scarcely one mile daily, in direction nearly east. This course is afterwards bent towards the south, crossing the meridian of Greenwich on the S.E. rhumb. I have been unable to determine whether it again changes its course to E. by N. or returns by a vortical current to the neighbourhood of the Horn. There are facts tending to support both of these hypotheses; but since near the meridian of Greenwich few ships go higher than lat. 50° S. we have not a sufficient number of observations to enable me to decide this question.

If, however, an iceberg happens to be carried to the left of the shaded line on the chart, situated between 50° S. 50° W. and 41° S. 80° W. it

continues its south-east course after it passes the fortieth parallel, and is carried towards the Cape of Good Hope. Thus in January, 1850, an iceberg was within sight of the Cape. In April, 1828, and in August, September and October, 1840, there were several icebergs in this locality.

From the consideration of these facts we draw the following practical conclusions :—

First. That the period comprising the months of November and December, 1854, and January, February, March and April, 1855, was a most extraordinary season for icebergs *. In every part of the southern hemisphere south of the fortieth parallel, the number of icebergs met with during these six months was beyond all recorded precedent. We had during that period a far greater number reported than the total of every other season from the time of Captain Cook down to the present year.† Whether such phenomena are periodical, or that of 1854-55 is an exceptional one, we cannot decide ; but from the reports of those who have been engaged in the seal trade, we believe that for fifty years previously there had been no season bearing the least comparison with the one under consideration. It has been observed that meteorological cycles exist in the southern hemisphere. If there exists a cycle in which such seasons return, the period must be secular. One individual cannot therefore determine this point. Under this impression I beg to record the result of my investigations in the Transactions of this Society ; it being one of the advantages of Scientific Societies that they can undertake to carry on investigations which require a period for their completion beyond that of the life of any individual.

Secondly. On the outward passage, from the meridian of the Cape of Good Hope to Australia, there is no parallel that possesses an immunity from icebergs. In one year the greatest number is met with on one parallel ; in another year on a different one. We cannot regard it as a general rule in this region, that the average number is greater in the

* On the accompanying chart and catalogue we have distinguished the ice of this period by figures, the ice of other periods by letters.

† Since reading this paper I have received accounts of the ice sighted in the months of January, February and March, 1858. Although this season bears no comparison with that of 1855, the number of icebergs already reported greatly exceeds the average. In printing this paper it has been thought proper to extend it so as to include all reports received up to the time of going to press.

higher than in the lower latitudes, till we attain the parallel of 52° S., above which the danger is considerably increased. In seasons when icebergs are numerous, no outward bound ship has adopted a maximum latitude higher than 52° S. without meeting with a greater number than that sighted by those who have sailed on the lower parallels. We therefore recommend on this ground as well as others previously discussed that 51° S. should be the maximum latitude in voyages to Australia. The parallel of 53° S. is also dangerous on account of the islands and rocks which were discovered by Captain M'Donald of the "Oriental," in November, 1853, and known by the name of M'Donald's Islands;* the westernmost being situated about $52^{\circ} 50'$ S., and $73^{\circ} 50'$ E.; the easternmost $53^{\circ} 20'$ S. and $74^{\circ} 20'$ E.

Thirdly. That on the homeward passage to the meridian of 80° W., a greater number of icebergs are met with in the lower than in the higher latitudes. Thus, in November, 1854, the "Great Britain" passed two hundred and eighty icebergs in latitude 56° S., between the meridians of 112° W. and 92° W., independently of numerous icebergs in other localities. On the other hand, the "Golden Era" passed these meridians at the extraordinary latitude of 63° S., without meeting with an iceberg. It was not until she arrived at 72° W. that any inconvenience was experienced from ice, when she was surrounded by pack ice, in which she narrowly escaped being wrecked. The isothermal line of latitude 51° S. and longitude 40° E. † appears to pass through latitude 61° S. in longitude 140° W., consequently a much higher maximum latitude may be adopted for the homeward passage. But, from June to December inclusive, the parallel of 57° S. should be preferred, since in most cases those who have adopted the higher parallel have been either impeded or endangered by pack ice.

Fourthly. That by far the greatest number of icebergs is met with in

* About three years subsequently to the discovery of these islands and rocks they were reported as being discovered by the Captain of a ship engaged in the seal trade, belonging to the United States of America, although they had previously been reported by the Captains of several English ships, and were at the time laid down in the Admiralty Charts.

† This hypothesis must only be regarded as being founded on the very limited number of observations that have been brought under my notice. We must await the returns of the Meteorological Department of the Board of Trade for several years before we can regard this important fact as established or otherwise.

the Southern Hemisphere during the six months of November, December, January, February, March and April. I have not the record of a single iceberg having been sighted in the midwinter months of June and July, and they have been seldom reported in the months of May and August.

Fifthly. Eastward of the Horn there is a space bordering on both the outward and homeward track, which may be regarded as dangerous from ice. In the accompanying chart this region is distinguished by being surrounded by shaded lines and in the subjoined catalogue all ice that has been reported within its limits is distinguished by an asterisk.(*). From November, 1854, to April, 1855, this part of the Southern Ocean was so crowded with ice that no ship entered it without incurring serious risk; and generally we have more reports of ice in this area than in any other region of the Southern Hemisphere, although, in consequence of a caution extensively circulated, most Australian ships avoid entering this locality. It was here that the "Golden Era" was entangled in September, 1854; in August of the same year the "Red Jacket" lost four days amongst the ice in this region; in the same locality the "Champion of the Seas" spoiled her homeward passage in March, 1855; in the same month the "Guiding Star" was lost with all hands, on her outward passage, and we have before observed that it was amongst the same ice that the "Cambridge" and "Salem" incurred very serious risk. Under these circumstances, I have hesitated whether it might not have been desirable to modify the outward composite track now generally adopted, by delaying to cross the fortieth parallel till the longitude of 10° E. is attained. If it were not from the belief that the season 1854-1855 was an exceptional one, I should have certainly exerted my influence thus to have altered the outward composite route, although by so doing less favourable currents would be obtained, and there would be a greater risk of encountering unfavourable winds. Since April, 1855, however, the only report of icebergs sighted in this part of the outward composite route which would have been avoided if this suggested modification had been adopted, was in May, 1855, latitude 49° S., longitude between 6° E. and 12° E., and also in March, 1856, in latitude $46^{\circ} 50'$ S. and longitude $3^{\circ} 11'$ E. We therefore do not, at present, feel ourselves called on to press this alteration.*

As far however as the homeward passage is affected by the consideration

* See also in remarks on Catalogue and Chart.

of this locality, it tends only to confirm our previous convictions, and we have more abundant reasons than ever to impress on the mariner the propriety of sighting the Horn and the Falkland Islands on his homeward passage. He has every inducement to follow this track. It is favorable for making a short passage, and it will keep the ship clear from the only locality adjacent either to the passage out or home, in which real danger exists on account of the ice. I think great sacrifices should be made to follow this part of the route home rigidly, for I have not met with any very extraordinary voyage home made by a ship that has given to the Horn or the Falkland Islands a wide berth. In all cases in which no danger has been experienced from ice, delays have been occasioned and the passage has been spoiled, nor have I a case on record in which any mariner, following this advice, has met with ice after arriving east of the meridian of 75° W.

And lastly. In all ships adopting the composite route to or from Australia, a good look out should be kept, and the changes of the thermometer should be carefully observed. Captain M'Donald of the "James Baines" met with a considerable number of icebergs in his late extraordinary passages, but he observes that these stray icebergs do not considerably increase the risk with a prudent and careful captain. He has only to notice his thermometer to be forewarned of the approaching danger. In one case he found that the thermometer fell 4° as he approached the ice, and 2° more as he got to leeward of the berg. Captain Newland, in the log of the "Champion of the Seas," proves also that the thermometer not only indicates the approach towards ice, but also the amount of ice we may expect to meet with. In latitude $58^{\circ} 30'$ S. he passed two icebergs, the temperature of the water being 44° and that of the air 42° . Between 50° S. and 47° S. he passed thirty-nine icebergs, the thermometer then fell to 35° in water and 36° in air. In this instance the temperature was 8° or 9° lower, although the ship had sailed about 10° nearer to the equator, at which point the mean temperature is 10° higher. In one case however, it is reported that the temperature of neither the air nor water was sensibly affected when an iceberg was approached. It is probable that in this instance some meteorological change might have counter-balanced the effect of the proximity of ice. But, if otherwise, this single exception cannot prove that the thermometer may be neglected, but rather enforces the necessity of keeping a most careful look out at all times.

REMARKS ON THE CATALOGUE AND CHART.

In the following catalogue the ice is arranged according to the month in which it was observed, so as to show at a glance, when examining the chart the comparative amount in any month. That which has been met with in the region we have designated as "dangerous from ice" in the chart, is indicated in the catalogue by an asterisk.* In both the catalogue and the chart we can readily distinguish the ice impediments which were encountered during the extraordinary six months in the years 1854-1855 by their indices being numbers and all other indices being letters. The capital letters represent the situation of ice seen at other seasons in passing to and from Australia, and the small letters ice sighted on voyages to other places.*

In obtaining the data of which the catalogue is a record, I have examined about two hundred and fifty† logs of Australian ships. Of these one hundred and four contain reports of ice. Besides which I have received forty-one separate records of ice observed in the Austral seas derived from other sources. In very many cases the same ice has been reported as seen from several ships, and as having been met with during the same month. In such cases only one entry is made and the latitude and longitude given is the mean of these given in the several reports. But if seen in more than one month from different ships, one report for each month is given although there exists no doubt of its being the same ice. The reports of "the connected icebergs" form the most remarkable example of this. They are twenty-one in number, extending through five consecutive months commencing with December, 1854. Its position for the mean of each month is given in the catalogue and its position is indicated on the chart between the indices eight and nine. It will be observed that in the immediate vicinity of the Composite route to Australia, as laid down on the chart, between the meridians of 20 W. and 46 E., numerous reports of

* The numerous icebergs extending from 62 S. and 80 W. to 53 S. and 82° W. were met with by ships going to the west coast of America, but having been observed during the month of December, 1854, we have marked them with the index 3, the same as that which represents ice seen on passages to and from Australia during the same month.

† I had commenced the practice of examining ships' logs for ice a considerable time before it had occurred to me that it was desirable to note cases in which the voyage had been made to and from Australia without meeting with ice. But since December, 1856, I have recorded one hundred and eighteen such cases.

ice are recorded. The comparison of this region with other parts of the area designated as "dangerous from ice" might lead to a wrong conclusion, unless we take into consideration the fact that nearly two hundred of the ships before referred to have passed within a hundred miles of this route, and that more than three-fourths of these met with no ice there, whereas on the homeward voyage only eleven ships from which I have received reports had entered this region, and each of these had encountered ice.

It is a very remarkable fact that amongst the numerous reports I have received from Australia going ships, not one was within the region in which ice is met with during the month of October, 1854. This is much to be regretted, since this was the month that preceded the extraordinary season of 1854-1855, and in the previous month numerous icebergs were met with. I should be particularly obliged to any captain who was navigating these seas in October, 1854, if he would communicate to me whether he met with any ice, or otherwise.*

INDEX TO CHART.	DATE.	LATITUDE.		LONGITUDE.		DESCRIPTION.
<i>a</i>	August, 1840.	38	30 S.	1	0 E.	Four icebergs.
<i>a</i>		36	10 S.	13	40 E.	Two icebergs.
<i>a</i>		37	30 S.	14	40 E.	An iceberg reported 1000 ft.
<i>A</i>	August, 1854.	*50	0 S.	41	0 W.	Several icebergs. [high.
<i>A</i>		*53	0 S.	47	0 W.	Icebergs.
<i>A</i>		*55	0 S.	51	0 W.	Pack ice.
<i>A</i>		*56	30 S.	60	0 W.	Pack ice.
<i>b</i>	September, 1840.	37	30 S.	10	0 E.	An iceberg.
<i>b</i>		37	0 S.	13	0 E.	An iceberg.
<i>b</i>		37	0 S.	15	0 E.	An iceberg.
<i>b</i>		37	0 S.	15	0 E.	An iceberg 1000 feet long and 400 feet high, prob- ably the same as the last named, observed from a different point.
<i>b</i>		41	30 S.	14	10 E.	An iceberg one mile in cir- cumference.
<i>b</i>		37	45 S.	14	50 E.	An iceberg.
<i>b</i>		40	30 S.	19	0 E.	Two icebergs.

* On submitting a proof of this Paper to the Meteorological Department of the Board of Trade, Admiral Fitz Roy was so kind as to furnish me with four reports of ice sighted during the month of October, 1854, extracted from a paper forwarded by Lieut. Maury. These I have distinguished in the chart and catalogue by the index X. I have also since received accounts of some extraordinary icebergs observed in December, 1856, one of which was 700 feet high and another 500 feet. Their locality is marked by index Y.

INDEX TO CHART.	DATE.	LATITUDE.	LONGITUDE.	DESCRIPTION.
<i>b</i>	September, 1840.	40 20 S.	26 0 E.	An iceberg.
<i>b</i>		37 30 S.	36 19 E.	Icebergs.
		to		
		38 47 S.		
<i>B</i>	September, 1844.	38 0 S.	24 0 E.	
		to	to	Numerous icebergs.
		39 15 S.	27 0 E.	
<i>B</i>		59 0 S.	140 0 W.	
			to	Numerous icebergs.
			150 0 W.	
<i>C</i>	September, 1854.	63 0 S.	69 0 W.	
		to	to	Pack ice.
<i>C</i>		*58 0 S.	72 0 W.	
<i>C</i>		*58 0 S.	56 0 W.	An ice field.
<i>C</i>		*44 40 S.	15 20 W.	Icebergs.
<i>C</i>		*47 30 S.	10 40 W.	Icebergs.
<i>C</i>		*49 40 S.	1 40 W.	
			to	Numerous icebergs.
			0 20 E.	
<i>c</i>		48 0 S.	45 0 E.	An iceberg.
<i>D</i>	September, 1856.	55 33 S.	140 0 W.	An iceberg 420 feet high.
<i>e</i>	September, 1857.	*59 0 S.	61 20 W.	Pack ice.
<i>f</i>	October, 1840.	38 0 S.	12 0 E.	
		to	to	Five icebergs.
		37 0 S.	14 0 E.	
<i>g</i>	October, 1853.	53 0 S.	19 0 E.	An iceberg.
<i>g</i>		55 20 S.	23 10 E.	An iceberg.
<i>h</i>	October, 1855.	*48 0 S.	21 0 W.	A very large iceberg.
<i>E</i>	November, 1839.	44 0 S.	87 30 E.	
		to	to	Numerous icebergs 400 feet high.
		45 0 S.	100 0 E.	
<i>i</i>	November, 1840.	39 50 S.	33 40 E.	An iceberg.
<i>F</i>	November, 1853.	*47 40 S.	10 0 W.	An iceberg.
<i>F</i>		*40 45 S.	4 0 W.	An iceberg.
<i>F</i>		52 26 S.	19 42 E.	An iceberg 1500 feet long.
<i>F</i>		52 20 S.	27 47 E.	Three icebergs.
<i>F</i>		51 3 S.	32 21 E.	
		to	to	Numerous icebergs.
		51 20 S.	37 6 E.	
<i>F</i>		53 51 S.	86 40 E.	An iceberg.
2	November, 1854.	56 0 S.	112 0 W.	
			to	Two hundred and eighty icebergs.
			92 0 W.	
2		*61 0 S.	65 0 W.	
		to	to	Numerous icebergs.
		*58 0 S.	61 0 W.	
2		*58 0 S.	59 0 W.	Icebergs.

INDEX TO CHART.	DATE.	LATITUDE.	LONGITUDE.	DESCRIPTION.
2	November, 1854.	*56 30 S.	56 0 W.	Icebergs.
2		*44 20 S.	22 0 W.	Icebergs.
2		50 0 S.	30 0 E.	An iceberg.
2		52 0 S.	25 0 E.	
		to	to	Thirty-three icebergs.
		53 0 S.	45 0 E.	
2		51 0 S.	41 0 E.	
		to	to	Numerous icebergs.
		52 0 S.	45 0 E.	
2		53 0 S.	88 0 E.	
			to	Fifty-seven icebergs.
			102 0 E.	
G	November, 1855.	*48 0 S.	18 0 W.	A very large iceberg.
j	December, 1772.	49 46 S.	19 58 E.	
		to	to	Numerous icebergs.
		54 55 S.	21 44 E.	
k	December, 1789.	44 30 S.	44 30 E.	An iceberg.
l	December, 1830.	*57 0 S.	23 0 W.	Icebergs.
l		*56 30 S.	13 0 W.	Icebergs.
l		55 30 S.	13 0 W.	Icebergs.
l		58 0 S.	9 0 W.	
		to	to	Numerous icebergs.
		*57 0 S.	10 0 W.	
m	December, 1840.	39 24 S.	39 0 E.	An iceberg.
H	December, 1853.	48 30 S.	35 20 E.	An iceberg.
H		53 0 S.	95 20 E.	An iceberg.
3	December, 1854.	*62 0 S.	80 0 W.	
		to	to	Numerous icebergs.
		53 0 S.	82 0 W.	
3		*55 0 S.	49 0 W.	
		to	to	Numerous icebergs.
		*56 0 S.	47 0 W.	
3		*50 0 S.	30 0 W.	
		to	to	Numerous icebergs.
		*47 0 S.	47 0 W.	
8		*44 0 S.	23 0 W.	An immense connected mass of icebergs, greatest dimen- sions 60 miles, see page 4.
		to		
		*43 0 S.		
3		*50 0 S.	3 0 E.	
		to	to	Numerous icebergs.
		*53 0 S.	22 0 E.	
3		*52 12 S.	15 24 E.	Eight icebergs.
3		*50 30 S.	19 30 E.	Icebergs.
3		*53 0 S.	23 0 E.	
		to	to	Forty icebergs.
		*54 0 S.	25 0 E.	
3		49 0 S.	22 24 E.	An iceberg.
3		47 30 S.	23 30 E.	Icebergs.

INDEX TO CHART.	DATE.	LATITUDE.		LONGITUDE.		DESCRIPTION.
3	December, 1854.	49	40 S.	34	30 E.	Icebergs.
3		49	0 S.	36	0 E.	Icebergs.
3		48	0 S.	41	0 E.	Two icebergs.
3		44	0 S.	46	0 E.	
		to		to		Numerous icebergs.
		45	0 S.	51	0 E.	
3		53	0 S.	85	0 E.	
				to		Numerous icebergs.
				99	0 E.	
3		52	30 S.	84	0 E.	
				to		Numerous icebergs.
				102	0 E.	
n	January, 1773.	51	0 S.	59	0 E.	Icebergs.
o	January, 1850.	34	0 S.	20	20 E.	An iceberg seen from the Cape.
	January, 1855.	*42	0 S.	22	0 W.	Connected icebergs same as 8 and 9.
4		*41	0 S.	17	0 W.	An iceberg.
4		*42	0 S.	13	0 W.	An iceberg.
4		*42	0 S.	14	0 W.	Icebergs.
4		*45	45 S.	21	0 E.	Icebergs.
4		47	0 S.	37	46 E.	Icebergs.
4		50	0 S.	41	0 E.	Icebergs.
4		47	20 S.	41	10 E.	Numerous icebergs.
I	January, 1856.	*49	10 S.	14	0 E.	Icebergs.
I		45	30 S.	45	30 E.	Numerous icebergs.
I		50	20 S.	113	0 E.	Fifty-five icebergs.
J	January, 1858.	*53	30 S.	51	0 W.	Numerous icebergs, one three miles long.
J		*51	30 S.	47	49 W.	Numerous icebergs.
J		*53	0 S.	48	0 W.	Numerous icebergs.
J		*51	24 S.	44	53 W.	Icebergs.
p	February, 1774.	*54	0 S.	21	0 W.	Several icebergs.
p		*54	20 S.	15	30 W.	Three icebergs.
p		*53	30 S.	8	0 W.	Two icebergs.
p		*52	30 S.	4	0 W.	Three icebergs.
p		*53	54 S.	0	30 W.	Three icebergs.
p		*53	30 S.	6	35 E.	Three icebergs.
q	February, 1755.	*58	0 S.	6	3 W.	Three icebergs.
q		*57	20 S.	4	0 E.	An iceberg.
q		*54	26 S.	24	21 E.	Numerous icebergs.
q		52	50 S.	26	30 E.	Two icebergs.
5	February, 1855.	*51	0 S.	47	0 W.	Numerous icebergs.
		*41	30 S.	21	40 W.	Connected icebergs same as 8 and 9.

INDEX TO CHART.	DATE.	LATITUDE.	LONGITUDE.	DESCRIPTION.
5	February, 1855.	*41 30 S.	18 30 W.	Icebergs.
5		50 0 S.	107 0 E.	An iceberg.
5		46 0 S.	134 0 E.	Icebergs.
K	February, 1858.	*51 0 S.	47 0 W.	Numerous icebergs.
r	March, 1774.	*53 17 S.	11 50 E.	Icebergs.
r		*48 30 S.	14 30 E.	Two icebergs.
	March, 1839.	66 0 S.	98 0 E.	
		to	to	Numerous icebergs south of the limits of the chart.
6	March, 1855.	59 0 S.	132 0 W.	
		to	to	Numerous icebergs.
		58 0 S.	128 0 W.	
6		58 0 S.	118 0 W.	
			to	Numerous icebergs.
			136 0 W.	
6		*62 0 S.	60 0 W.	
		to	to	Numerous icebergs.
		*58 0 S.	67 50 W.	
6		58 30 S.	63 10 W.	
			to	Numerous icebergs.
			65 0 W.	
6		*52 30 S.	40 30 W.	Numerous icebergs.
6		*52 0 S.	39 0 W.	
		to	to	Thirty-nine icebergs.
		*44 0 S.	32 0 W.	
6		*40 0 S.	21 30 W.	
		to	to	Connected icebergs same as 8 and 9
		*41 0 S.	23 30 W.	
6		*42 20 S.	14 40 W.	Icebergs.
6		*50 0 S.	7 0 W.	
		to	to	Numerous icebergs.
		*52 0 S.	0 0	
6		*53 14 S.	14 41 E.	An iceberg 960 feet high.
6		*52 0 S.	0 0	
		to	to	Numerous icebergs.
		*53 20 S.	23 0 E.	
L	March, 1856.	*46 50 S.	3 11 E.	Icebergs.
L		46 0 S.	37 30 E.	Icebergs.
M	March, 1858.	*51 0 S.	50 0 W.	Icebergs.
M		*50 10 S.	47 21 W.	Seventeen large icebergs.
s	April, 1828.	35 50 S.	18 5 E.	An iceberg.
s		37 31 S.	18 17 E.	A very large iceberg.
N	April, 1853.	51 0 S.	131 0 W.	A large iceberg.
N		53 0 S.	120 0 W.	Six icebergs.
N		36 0 S.	20 0 E.	Numerous icebergs.
P	April, 1854.	53 0 S.	80 0 E.	Two icebergs.

INDEX TO CHART.	DATE.	LATITUDE.	LONGITUDE.	DESCRIPTION.
7	April, 1855.	57 0 S.	101 0 W.	Numerous icebergs.
7		58 0 S.	88 0 W.	Numerous icebergs.
7		57 0 S.	88 0 W.	Numerous icebergs.
			to 79 0 W.	
7		*48 20 S.	48 40 W.	Several icebergs.
7		*51 0 S.	44 0 W.	
		to	to	Drift ice, probably the debris of icebergs.
		*55 0 S.	40 0 W.	
7		*53 0 S.	41 0 W.	Numerous icebergs.
7		*52 0 S.	41 0 W.	Icebergs.
7		*51 0 S.	40 0 W.	
			to 39 0 W.	Numerous icebergs.
9		*40 0 S.	20 0 W.	Connected icebergs, greatest length 60 miles, the same as 8.
		to	to	
		*41 0 S.	22 0 W.	
7		*47 46 S.	7 47 W.	Three great icebergs.
7		*43 0 S.	5 0 W.	Numerous icebergs.
7		*48 30 S.	6 0 E.	
		to	to	Numerous icebergs.
		*49 0 S.	12 0 E.	
7		43 30 S.	13 0 E.	Numerous icebergs.
7		46 0 S.	27 0 E.	Numerous icebergs.
R	April, 1856.	46 0 S.	39 30 E.	An iceberg.
R		47 0 S.	53 0 E.	Several icebergs.
R		47 20 S.	58 0 E.	An iceberg.
t	May, 1839.	39 30 S.	16 41 E.	An iceberg.
S	May, 1855.	49 0 S.	11 0 E.	
			to 31 0 E.	Very numerous icebergs.
S		45 0 S.	37 40 E.	A very large iceberg.
S		48 0 S.	38 0 E.	An iceberg.
T	June, 1853.	60 0 S.	141 0 W.	Pack ice.
		to 57 0		
V	June, 1857.	61 41 S.	47 49 W.	
			to 44 0 W.	Pack ice.
X	October, 1854.	50 9 S.	29 26 E.	One large berg.
		50 39 S.	46 10 E.	One large berg.
		53 12 S.	21 23 E.	Three bergs and field ice.
		51 10 S.	26 20 E.	One berg.
Y	December, 1856.	50 14 S.	42 54 W.	Four large bergs, one 700 feet high and another 500.

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